Observations
on the
Effects of Sulphur,
in Increasing the
Sulphuric Acid
in the
Urine.

Alex. Jas. Main.
Although the action of co-
medicis in the cure of disease generally
is still a matter of great obscurity,
yet Chemistry and Physiology have
done much to advance our knowledge
of this subject. Previous to the time
when by Chemical Analysis, the
absorption of medicines could be
indisputably proved, it might in
fact have been supposed from the
Anatomy of the alimentary Canal
and reasoning from analogy, that
these remedies were absorbed into
the blood. The fact still however remains a matter of assumption, till by a more and more chemical knowledge we can state certainly, at least in many cases, that these remedies are absorbed into the blood, in which, or in the secretion of the secretions eliminated from it, we are enabled to detect them; these alterations perhaps in their chemical relations. Some remedies, such as arsenic and chloric acid, we know produce the same symptoms in what ever manner they are applied—whether to the mucous membrane of the stomach and bowels, to the skin, or cellular tissue. Concerning other remedies, however, that when taken internally are undoubtedly absorbed, there are still wanting sufficient facts to warrant the
Supposition of their being taken into the blood when applied to the skin. Among these latter may be placed Sulphur, which appears to form various experiments to be absorbed into the system, when taken internally, be shown by its increasing the Sulphuric acid in the urine.

Sulphur however is oftener used as an external than an internal remedy, and if Sulphur is taken into the blood from the stomach and bowels, we may natural enquire whether or not it may be absorbed. When applied externally, it is absorbed. May it be so in the form and not be another? These are questions which I have had answered; questions which, if they are but of much importance in the treatment of diseases, are
At least sufficiently interesting to warrant a careful inquiry.

My object then in this paper will be, by exhibiting a series of
analyses of the urine, in cases where sulphuric was applied to the
skin either in the form of ointment and pills, and calcined to ascertain
the bearing of the results on these questions. Further, having given
sulphuric in all cases, I have also noticed the effects of this mode of
taking it, and have compared them with the results obtained
from the other two, with a view to the elucidation of this subject.

I wish to express my kind thanks to the several patients under his charge, in the
Royal Infirmary....

Before proceeding to detail
the Experiments, of the results deduced from them, it may be proper to give a short account of what has really been ascertained, in regard to the origin and quantity of Sulphuric Acid in the urine, in Health and Disease, and the pathological indications which an excess or diminution give rise to, in order that we may understand the foundation on which we shall first then act to its physiological origin; it has been ascertained from various analyses of food, that a certain proportion of Sulphuric Acid must be taken into the system with food in such small quantities as lead to an excess or deficiency to account for the whole of the Sulphuric Acid found in the urine. This excess has been proved by several chemists to be due to the action of Sulphur Combustion.
in the albuminous constituents of the food, and since albumen is taken
into the system principally in the form
of animal matters, it may almost be supposed, that
when an excess of
these articles be is taken, the proportion
of sulphuric acid in the urine will
be considerably increased; while when
vegetables are substituted for the
animal food, the amount excreted
will be diminished. And this infact
has been found to be the case, the
quantity of sulphuric acid having
been nearly doubled by the same meal
the latter has caused. It must be mind
below the normal average. Cogot
examined the urine of a person whose
ordinary average excretion for 24 hours
was 2.02 grammes. That person having
taken a large supper composed a chile
of animal food the sulphuric acid
in the urine rose to 23 grain. For hours between midnight and nine o'clock and next morning, during the subsequent 24 hours the Sulphuric Acid rose to 7.3 grain. It was also observed by the same author, that when persons lived on a diet principally furnished, the Sulphuric Acid in the urine fell considerably. Clare has also obtained the same results from a series of experiments performed on himself. The accidental causes which increase the amount of Sulphuric Acid in the urine are the internal use of Sulphur, Sulphates, Sulphuric Acid, and Sulphates. It hence found that the internal use of Sulphur to increase the Sulphuric Acid. Boeckel & Clare found that Sulphuric Acid had the same effect, and Logel observed that Sulphuric Acid taken by the mouth materially
increased in.

What influence different physiological conditions may have on the amount of sulfuric acid excreted has not yet been determined. We do not know whether the excretion may be altogether stopped if the supply of sul-
phates are greatly limited, or whether they may accumulate and be retained within the system. According to Clarke and Williamson, the state of rest or activity does not materially affect its excretion. Vogel thinks that physiological state of the system, e.g. as an influence on the amount excreted, from observing that different persons under and after a diet high in the food, taken with the ordinary food, with different degree of constancy. He also believes that they may accumulate within the system.
The average excretion of sulphuric acid in healthy persons from various experiments, has been determined as 1.5-2.5 gramm. in the 24 hours.

Vogel supposed that the greatest quantity is given off after the principal meal of the day, that it then falls until after the corresponding meal on the next, when it again begins to rise.

The average excretion of sulphuric acid in disease has never been much examined into. Vogel found that it was diminished considerably in acute febrile diseases, and we know that patients suffering from these diseases take little animal food. Exceptions however have been found to this rule, as in three cases of meningitis which he examined, and in which the sulphuric acid was considerable hi-
increased. In these acute diseases it has been as low as 8.29 and 9.38 gram. And
in the case of typhoid fever which I examined was in three analyses
respectively 46.54, and 37 gramme in the 24 hours. In chronic diseases
Coppel found the amount of sulphuric
cetic to vary, but generally below
the normal average. This it has
been observed as low as 5 and 7 gram.
but it can always be raised by the
taking of sulphur internally.

The pathological indications which
may be deduced from an excess of elimi-
nation of the sulphuric acid in the
urea, are vague and unsatisfactory.
If the origin of the sulphuric acid
itself cannot be doubted, then the
elimination of the amount excessive,
will indicate the waste undergone
by the albuminous tissues, provided
As Sulphur is given internally in any shape or combination. It is supposed that the amount may then correspond to the quantity of luna, provided the fluid the kidneys will equal facility this is however doubtful. When the fluid area and Sulphuric Acid is increased quantities we may suppose that this is due to the oxidation of Animal Matter taken as food. On the other hand a considerable elimination will lead us to suppose that little or no Animal food has been taken for some time past.

The relation of Sulphur to the Animal Economy is complex, and it is not known whether the transformation of any into Sulphuric Acid is confined to the blood, or whether the liver may have something to do in this fluid oxidation.
Having ascertained the origin and normal quantity of fulphuric acid in the urine in health, its variations in disease as far as they are known, and the only pathological indications which can, as yet, be deduced from them, I shall now proceed to the more immediate subject. And first it will be necessary to explain the method of analysis employed, and the mode in which I have conducted my analyses. Before doing so let me express my sincere thanks to Dr. George for his valued assistance both in making the test solutions, and in showing me how best to conduct my analyses.

The method of analysis which I have chosen is that of the Volta-Meissel, first introduced by Gay-Lussac, but up to a recent
time, are employed for ascertaining the quality of the alkalies. By sufficiently diluting the test solution, however, so as to adapt it to the small quantity of sulphuric acid in the urine, the same generally to be employed in the analysis of that description. “The proceeding consists in adding to a measured quantity of urine, a solution of chloride of barium of known strength, until a precipitate is no longer obtained.” The equivalent of the test fluid is to contain just so much barium as is required to neutralize 10 milligrams of sulphuric acid.

In preparing a chloride of barium, it was precipitated, and introduced into a bell or bell, where it was exposed to a low heat, until it was turgid, cold, washed 30.5 grams. Here
this dissolved in exactly one litre
of distilled water. Of this solution
1 cubic centimetre will precipitate
10 milligrams of anhydrous sulphuric
acid. On trials that greater accuracy
might be obtained later times as
allate solution, according to the re-
commendation of Reubandt, was made
by dissolving 100 C.C. of this
solution in 700 C.C. of distilled
water. Of this allate solution the
C.C. is required to precipitate 10
milligrams of sulphuric acid. To
and respect that it may be
stated that the first or strongest
was designated Solution A while
the Second or weakest was called
Solution B. Let it be more necessary
to the analyses that are con-
structed. Spoken of or these applications
All my analyses have been
have been conducted in the following manner.

50 c.c. of wine, carefully measured, was introduced into a Florence flask, acidulated with a few drops of nitric or hydrochloric acid; heat being first applied it was kept at the boiling point for a few seconds. The Barium solution, contained in a flask which measured 50 c.c., and which was graduated into fifths of a cubic centimetre, was added in successive portions. After each addition, the wine was raised and maintained at the boiling point for a second or two, in order to render the subsequent filtration easier. A small quantity was then filtered into a test-tube, and tested with a drop of the Barium solution; if a precipitate were obtained, then the filtrate, with the washing of the test-tube, were poured back into the retort, and the process...
upset until the precipitate was produced. It was now necessary to ascertain that only a sufficient quantity and not an excess of the chloride of Barium had been added. This was done by filtering a portion into a clean test tube, and then adding a drop of a solution of Sulphate of Magnesia, which of course gave a white precipitate when an excess of Barium was present. In testing both the first Chloride solution great difficulty was experienced in arriving at the point where the precipitate was obtained either by the Chloride of Barium or Sulphate of Magnesia, an excess of the formed being generally found present. It was however always possible to arrive at precise results by this analysis. For suppose we had obtained a precipitate
When 9 c.c. of the Chloride had been added, and that at 10 c.c. no precipitate was produced, it necessarily followed that the correct result layed between the two quantities. By taking a fresh portion of urine therefore, 9 c.c. of Solution A were at once added, and to make the analysis quite correct, the Solution B was substituted until the desired result was obtained.

In determining the exact quantity of Sulphuric Acid excreted from day to day, I have endeavoured to be as accurate as possible, the reason being that without this accurate value could be placed on the results. Each analysis has been done three or four times from arriving at the same value, these chance, where no precipitate was affected, uttered by the Chloride.
A Sulphate, I considered that having 18 
uplated the tests two or three times 
be doted to make one; its second 
Analysis was required.

Before however causing the 
patient to use Sulphur in any shape, 
it was necessary to analyze the 
mine for several days previously 
in order that the mean average 
gonation might be obtained. Having 
ascertained this, I was enabled 
easily to find out how far the Sulphur 
treatment affected the Sulphuric 
Acid exceeded over 24 hours, the time 
it took to do so, and the quantity 
necessary to effect it.

The first case which I pro-
pose stating was one in which, 
Sulphur was administered intem- 
ally. It was that of a man, 
who, for some time past had been
becoming gradually weaker and weak for his food, and this celebrity had allowed his memory beginning to fail within the last few months. He also became affected with paralysis of speech. While analyzing his urine his diet consisted of:

**Breakfast: Coffee, Bread + Butter & Egg**

**Dinner: Beef, Tea, Noodles, Potatoes, Asparagus, Bread + Butter & Tea.**

In the first analysis made, he passed in 24 hours 2,700 C.C. of urine in 48 hours, 1,005. In determining the amount of sulphuric acid 50 C.C. of urine required to complete precipitation 2 C.C. of solution A. Required 0.20 gram of sulphuric acid or 0.020 x 2 = 0.040 gram in 100 C.C. of urine, therefore as 100 : 0.040 : 2900 : 1.16 gram total amount excreted in 24 hours.
In the second analysis he passed 3100 C.C. of urine in 24 hours of Sp. gr. 1008. Amount of Sulphuric Acid 57 C.C. of urine required for complete precipitation 2 C.C. of Solution. Acid = 0.20 gram of SO₃ or 0.20 x 2 = 0.40 gram of SO₃ in 100 C.C. of urine. Therefore as 100 : 0.40 :: 3100 : 1.20 gram total amount executed.

In the third analysis he passed 2504 C.C. of urine in 8 hours 1008. Amount of SO₃. 50 C.C. of urine required for complete precipitation 2 C.C. of Sol. A + 4 C.C. of Sol. B = 0.24 gram of SO₃ or 0.24 x 2 = 0.48 gram in 100 C.C. of urine.

Therefore as 100 : 0.48 :: 2504 : 1.20 gram total executed.

In the fourth analysis he passed 2265 C.C. of urine in 8 hours 1009. Amount of SO₃. 50 C.C. of urine
Required for complete precipitation 4 c.c. of solution A which are equivalent to .040 gram. of Na₂O₃ 0.040 x 2 = .080 gram in 100 c.c. of urine.

Therefore as 100 : .080 : 22.65 : 1.81 gram total excreted.

At the fifth analysis he passed 17.33 c.c. of urine. Sp. gr 1009. Amount of Na₂O₃. 50 c.c. of urine require for complete precipitation 3 c.c. of solution A = .030 gram. of Na₂O₃ 0.030 x 2 = .060 gram in 100 c.c. of urine.

Therefore as 100 : .060 : 17.33 : 1.03 gram totally excreted.

At the eighth analysis he passed 24.82 c.c. of urine. Sp. gr 1008. Amount of Na₂O₃. 50 c.c. of urine require for complete precipitation 3 c.c. of solution A = .030 gram. of Na₂O₃ 0.030 x 2 = .060 gram in 100 c.c. of urine.

Therefore as 100 : .060 : 24.82 : 1.48 gram.
In the seventh analysis he passed 3292 c.c. of urine of sp. gr. 1.008. And of \( \text{SO}_3 \) 50 c.c. required for complete precipitation 20 c.c. of solution A + 10 c.c. of solution B = to 0.21 gram. \( \text{SO}_3 \) by 0.21 x 2 = 0.42 gram in 100 c.c. e.

Therefore as 100: 0.42 = 3272 :: 1.37 gram.

Total excreted.

Over a period of 8 days in which I made seven analyses, while living on a certain diet, the excretion of Urephonic Acid was as under:

1.16 gram
1.24 "
1.20 "
1.81 " The mean being 1.03.
1.03 "
1.48 
1.37 "

Having ascertained his average excretion he was ordered to take Sulphuric
Elecyte, consisting of equal parts of Sulphur and Jadeite. If this he took
a teaspoonful morning and evening.
On the clay following, after tending
the close of the electrolysis the preceding
evening and another that morning, only
however about an hour before the
steps collecting his urine, he passed
2200 C.C. of urine. (P.) 1008. Amount
of $SO_3$ 50 C.C. required for complete
Precipitation. 3 C.C. of Solution. A which
$=0.30$ gram of $H_2SO_3$ $0.70 \times 2 = 0.60$
gram of $SO_3$ in 100 C.C. of urine.
Therefore as 100 : 0.60 :: 2200 :: 1.32
Total Argent excess. In this analysis
however I appeared that the second
also had little or no effect on the
Sulphuric Acid, seeing it had been
taken to that a time before he came
collecting his urine.
At the next Analysis after
having had five doses of sulphur elec-
table, the case however as in the pre-
ceeding case only an hour previous to the
time when he had ceased to collect his urine.
He passed 2200 c.c. of urine of exp. 41.
1069 c.c. amount of SO₃. 37 c.c. of urine
required for complete precipitation 4
C.C. of solution A + 9 C.C. of solution
B = .049 gram. of SO₃ or .049 x 2 = .098 gram. of SO₃ in 100 C.C. of urine
therefore as 100:1.098:2250 = 2.15 gram.
total executed.

After having had five doses of the
electrician at the Almshouse came as
which USD only accessible to the appas
of it, but also rendered it impossible
to collect all the urine during the
proceeding 24 hours. 1150 C.C. were
however collected the exp. 81. of which
was 1008. but he acknowledged that
passed much more at stock.
Amount of $\text{SO}_3$ - 50 C.C. required for complete precipitation 5 C.C of solution + 8 of col. B = 0.58 gram of $\text{SO}_3$ or 0.58 x 2 = 1.16 gram in 100 C.C of urine. And if we now take 2200 C.C as an average excretion we obtain the following. As 100 : 1.16 :: 2200 : 2.53 gram total excreted.

His clearance unhappily continued several days and required that these experiments should be stopped. Already however we see a decided increase over his ordinary excretion during the previous seven days.

His urine collected 60 hours after the last dose of the electrolyte had been taken, amounted to 2150 C.C. or 1006. Amount of $\text{SO}_3$ - 57 C.C of urine required for complete precipitation 2 C.C of solution A + 1 C.C of solution B = 0.21 which x 2 = 0.42 gram in 100 C.C of urine.
Therefore, as $107.042 \times 2150 = 90$ grams total were excited. It would appear from this that the effect of the Tulphead passes off quickly, but as he was labouring under diathesis, it is very probable that this affected the result.

In the second case, and the one in which I employed Tulphead Ointment, was that of a man who for some years past had been subject to epileptic attacks, and who besides was now suffering from a slight skin eruption. After having ascertained the average amount of Tulphead Ointment excited when placed on a state of hair, Tulphead Ointment was ordered, which he continued to rub for some time over his arms, chest, abdomen, legs, and feet. His diet which remained the same was as under.
Breakfast - Bread and Butter, Tea, an Egg. 
Dinner - Beef-tea, Steak, Potatoes and in addition 1 pint of the bitter ale, 
Supper - Tea, Bread and Butter.

In the first analysis he passed 2200 c.c. of urine in 24 hours. 
Esp. 10 20 - Amount of Sulphuric Acid, 50 c.c. of urine required for complete 
precipitation. 5 c.c. of solution A + 2 c.c. of solution B = 0.52 gram of SO3, 
0.052 x 2 = 0.104 gram in 100 c.c.

Therefore as 100 : 0.104 :: 2200 :: 2.28 gram.
the Amount Excreted.

In the second analysis he passed 2400 c.c. in 24 hours. Amount of SO3 
50 c.c. of urine required for complete 
precipitation. 4 c.c. of solution A + 1 c.c. of solution B = 0.41 gram of SO3, 
0.041 x 2 = 0.082 gram of SO3 in 100 c.c. of urine.

Therefore as 100 : 0.082 :: 2400 :: 1.96 gram.
In the third he passed 2344 C.C. of urine 28 Sep. 31 1915. Amount of Sulphuric Acid, 50 C.C. of urine required for complete precipitation, 4 C.C. of Solution A + 5 C.C. of Solution B, which = 0.65 gram of SO₃, 0.45 X 2 = 0.90 gram in 100 C.C. of urine therefore as 100 : 0.90 :: 2344 : 2.20 gram. Total amount excreted.

In the fourth he passed 1533 C.C. of urine 30 Sep. 31 1915. Amount of Sulphuric Acid, 50 C.C. required for complete precipitation, 7 C.C. of Solution A + 2 C.C. of Solution B = 0.72 gram of SO₃ or 0.72 X 2 = 1.44 gram of SO₃ in 100 C.C. of urine therefore as 100 : 1.44 :: 1533 : 2.20 gram.

In the fifth, he passed 1221 C.C. of urine 0 Sep. 21 1921. Amount of Sulphuric Acid, 50 C.C. required for complete precipitation, 6 C.C. of Solution A + 6 C.C. of Solution B = 0.66 gram of SO₃ or 0.66 X 2 = 1.32 gram in 100 C.C. of urine.
therefore as 100 : 132 : 1221 : 1.61 gram
In the eighth he passed 190 C.C. in 26 hours. Amount of Sulphuric Acid. 50 C.C. required for complete precipitation. 6 C.C. of Solution A + 2 C.C. of Solution B = 0.62 gram. of S03
0.62 x 2 = 1.24 gram in 100 C.C. of wine.
therefore as 100 : 1.24 : 1900 = 2.35 gram.
In the twelfth, he passed 1410 C.C.
ep. gr. 1019. Amount of Sulphuric Acid. 50 C.C. required for complete precipitation. 5 C.C. of Solution A + 4 C.C. of B = 0.54 gram. of S03
0.54 x 2 = 1.08 gram in 100 C.C. of wine.
therefore as 100 : 1.08 : 1410 : 1.52 gram.
In the eight, he passed 1732 C.C. of wine. ep. gr. 1018. Amount of Sulphuric Acid. 50 C.C. of wine required for complete precipitation. 6 C.C. of sol. A + 9 C.C. of sol. B = 0.62 gram. of S03
0.69 x 2 = 1.38 gram in 100 C.C. of wine.
therefore as 100:138:1732:2.39 gram.

In the ninth, he passed 2272 c.c. in 24 hours, Op. 91, 1015. Amount of Sulphuric Acid 50 c.c. required for complete precipitation. 4 c.c. of Solution A + 3 c.c. of Solution B = .043 gram of SO₃ or .043 x 2 = .086 gram in 100 c.c. of urine.

therefore as 100:.086:2272:1.95 gram.

He was now ordered to apply the Compound Sulphur Ointment. Did not void the pipes before mentioned. After the application, he passed 1210 c.c. Op. 91, 1024. Amount of Sulphuric Acid. 50 c.c. of urine required for complete precipitation. 9 c.c. of Solution A + 4 c.c. of Solution B = .094 gram of SO₃ or .094 x 2 = .188 gram in 100 c.c. of urine.

therefore as 100:.188:1210:2.27 gram.

After two applications of the Sulphur Ointment, he passed 1630 c.c. of urine in 24 hours. Op. 91, 1022. Amount of SO₃...
50 c.c. required for complete precipitation
7 c.c. of Solution A + 6 c.c. of Solution B
= 0.76 gram of S0₂ or 0.76 x 2 = 1.52 gram in 100 c.c. of wine.
Therefore at 10:15:15.1630 : 2.47 p.m.
The patient now without saying anything gave up the ointment and as a result of its roughness, and as it would have been impossible to form any opinion from the above results, I decided to begin the whole anew. Accordingly, having allowed several days to elapse, I again began to determine his average secretion, before applying the Sulphur Ointment.
In the first analysis he passed 1.360 c.c. of urine in the 24 hours. Ep. p. 10.20.
Amount of Sulphuric Acid. 50 c.c.
Required for complete precipitation 6 c.c.
of Solution A + 1 c.c. of Solution B.
= 0.061 gram of S0₂ or 0.061 x 2 =
122 gram in 100 C.C. of urine. Therefore as 100: 122 = 1360: 1.65 gram.

During the next 24 hours he passed 1640 C.C. of urine. Amount of Sulphuric Acid. 50 C.C. of urine required for complete precipitation 2 C.C. of Solution A + 4 C.C. of Solution B. Solution B = 0.64 gram of SO₃ or 0.064 x 2 = 0.128 gram in 100 C.C. of urine. Therefore as 100: 128 = 1640: 2.09 gram. Total excreted in 24 hours.

On the next 24 hours he passed 1300 C.C. of urine. Sp. gr. 1.022. Amount of Sulphuric Acid. 50 C.C. of urine required for complete precipitation 7 C.C. of Solution A + 6 C.C. of Solution B.

= 0.76 gram of SO₃ or 0.076 x 2 = 0.152 gram in 100 C.C. of urine.

Therefore as 100: 152 = 1300: 1.97 gram.

In the following he passed 1260 C.C. of urine. Amount of Sulphuric Acid 50 C.C. of urine required for complete
Precipitation 8 c.c. of Solution A + 2 c.c. of Solution B = 0.82 gram of SO3,
0.082 x 2 = 0.164 gram in 100 c.c.
therefore as 100: 0.164 :: 1210: 1.98 gram.
In first analysis he passed 1590 c.c. of urine in 24 hours. Exp. p. 1022
Amount of SO3 = 50 c.c. of urine required for complete precipitation 6 c.c. of Sol.
A + 8 c.c. of Sol. B = 0.68 gram of SO3
0.068 x 2 = 0.136 gram in 100 c.c. of urine.
therefore as 100: 0.136 :: 1590: 2.16 gram.
Urine collected for analysis over 24 hours 2450 c.c. Exp. p. 1013.
Amount of Sulphuric Acid = 50 c.c. required for complete precipitation 3 c.c. of Solution A + 5 c.c. of Solution B = 0.35 gram of SO3
0.035 x 2 = 0.070 gram in 100 c.c. of urine.
therefore as 100: 0.070 :: 2450: 1.71 gram.
In this the urine collected for analysis was 1980 c.c. Exp. p. 1016.
Amount of Sulphuric Acid = 50 c.c. ac. 34 g
required for complete precipitation 5 c.c. of Solution A + 7 c.c. of Solution B = 0.58 g
Grams of SO₃ or 0.58 x 2 = 1.16 grene in 100 c.c. of urine.

Therefore as 100 : 1.16 :: 1900 : 2.20 grene.
He was once again ordered to continue the Sulphated Diet. After two applications, the urine for analysis contained 1500 c.c. 0.1620.
Amount of SO₃ = 50 c.c. of urine again for complete precipitation 7 c.c. of Solution A + 7 c.c. of Solution B = 0.77 grene.
Grams of SO₃ or 0.77 x 2 = 1.54 grene in 100 c.c. of urine.

Therefore as 100 : 1.54 :: 1500 : 2.31 grene.
After four applications the urine for analysis was 2680 c.c.
0.15 g. Amount of SO₃ = 50 c.c. of urine for complete precipitation 4 c.c. of Solution A + 7 c.c. of Solution B.
\[= 0.47 \text{ g} \times 0.5 = 0.235 \text{ g} \times 2 = 0.94 \text{ g} \]

therefore as 100 : 0.94 : 2480 : 2.33 g.

After 64 applications he passed 1550 c.c. in 24 hours. 3p. 8. 1020.
Amount of \(S_2O_3\). 50 c.c. required for complete precipitation 7 c.c. of sol. A + 7 of sol. B = 0.77 g. = 0.77 \(S_2O_3\) 0.77 \(\times 2 = 1.54\) g. in 100 c.c. of urine.
Therefore as 100 : 1.54 : 1550 : 2.38 g.

After eight applications he passed 1520 c.c. of urine. 3p. 8. 1020.
Amount of \(S_2O_3\). 50 c.c. required for complete precipitation 7 c.c. of sol. A + 1 c.c. of sol. B = 0.71 g. = 0.71 \(S_2O_3\) 0.71 \(\times 2 = 1.42\) g. in 100 c.c. of urine.
Therefore as 100 : 1.42 : 1520 : 2.15 g.

After ten applications he passed 1220 c.c. of urine. 3p. 8. 1024.
Amount of \(S_2O_3\). 50 c.c. of urine.
required for complete precipitation of Solution A + 6 of Solution T3 = .096 gram of SO₃ or .096 x 2 = .192 gram in 100 c.c. of urine

therefore as 100: .098 :: 2150: 2.10

forty-eight hours after the last application of sulphate water, he passed 170 c.c. of urine. Amount of sulphuric acid: 50 c.c. required for complete precipitation of Solution A + 4 of Solution T3 = .084 gram of SO₃ or .084 x 2 = .168 gram in 100 c.c. of urine

After eleven applications he passed 2150 c.c. of urine in 24 hours

Op. yr 1020. Amount of SO₃ = 50 c.c. required for complete precipitation of Solution A + 9 of Solution T3 = .048 gram of SO₃ or .048 x 2 = .098 gram in 100 c.c. of urine

therefore as 100: .098 :: 2150: 2.10
therefore as 107° 168° 117° 96° 91° 96° 91

If we then compare the results obtained from the three series of experiments, it follows that,

1st. The daily excretion, while applying the Sulphur was always above the mean average expected, while living on an ordinary diet.

2nd. That although always above the mean average, still the daily excretion was occasionally lower than some of the quantities expected, while not applying Sulphur.

3rd. That the total amount excreted over a period of six days, was considerably higher than the results obtained over a like time previous to the application of the Sulphur.

4th. That on the Sulphur being omitted for 48 hours, the amounts deposited again fell below the averages.
The experiments performed previous to this being 38
thre sulphur, were three
Daily excretions for six days without sulphur
2.20
1.61
2.35
1.52 - Mean being 2. gram.
2.42
1.95
Total 12.05 gram.

Daily excretions for six days without sulphur.
2.09
1.97
1.98
2.16 - Mean being 2.01 gram.
1.71
2.20
Total 12.11 gram.

The results obtained while using sulphur were as under.
Daily excursions for air alone with Sulphur
2.31
2.33
2.38
2.15 - Mean being 2.26 -
2.34
2.10
Total 13.61
The total exceeding the two previous results by respectively 1.35 and 1.30 gram.

Having now given a fair trial to Sulphur in paint, I took the opportunity of testing the effects of Sulphur used in the form of bath in the amount of Sulphuric Acid as curd by the kidneys.
The case was that of an old man who has suffered severely from rheumatism who has lower troubles in the kidneys.
He was also suffering from Rheumatism and was taking Sulphuric
Of Potassium baths, with temporary benefit. While the experiments were being carried on he was living on the bullmace diet.

Breakfast - Bread, Tea, an Egg, 1 pt.

Dinner -    Roast, Bread, Steak, Potatoes.

Supper -   Tea, Bread, 1 2 pt of Sweet Milk.

First analysis previous to using the sulphad baths. Total quantity passed in 24 hours 1584 c.c. of urine - Amount of Sulphuric Acid. 37 c.c. of urine required for complete precipitation 2 c.c. of solution A, which = .040 gram of S of 97.040 x 2 = .080 gram in 100 c.c. of urine therefore as 100 : .080 :: 1584 : 1.26 gram total excreted in 24 hours.

In the next, he passed 2160 c.c. of urine Op. 21. 10-23. Amount of Sulphuric Acid
50 C.C. required for complete precipitation.
4 C.C. of Solution A + 2 C.C. of Solution B.

which = .042 gram of SO₂ or .042 x 2 = .084 gram.
in 100 C.C. of urine

therefore as 100 : .084 :: 2160 : 1.81 gram.

In the third, he passed in 24 hours
1300 C.C. of urine. Ep. p. 1013. Amount of
Sulphuric Acid. 50 C.C. required for complete
precipitation. 4 C.C. of Solution A + 2 C.C. of
Solution B. which = .042 gram of SO₂ or .042
x 2 = .084 gram. in 100 C.C. of urine

therefore as 100 : .084 :: 1300 : 1.04 gram.

In the fourth, he passed 2121 C.C.
Acid. 50 C.C. required for complete pre-
precipitation. 4 C.C. of Solution A + 4 C.C. of Solu-
tion B. which = .044 gram of SO₂ or .044 x 2 = .088 gram. in 100 C.C. of urine.

therefore as 100 : .088 :: 2121 : 1.86 gram.

In the fifth, he passed 1823 C.C.
of urine. Ep. p. 1013. 50 C.C. required for
Complete precipitation $3.0 \text{ C.C} \text{ of solution}$ $A + 5 \text{ C.C} \text{ of solution} \ B$ which $= 0.35 \text{ gram}$ of sulphuric acid $0.35 \times 2 = 0.70 \text{ gram}$

in $100 \text{ C.C} \text{ of urine}$

therefore as $100 \times 0.70 = 72.23 \times 1.27 \text{ gram}$.

In the Guth, he passed $2075 \text{ c.c}$.

of urine $Sp. gr. 1011$. Amount of sulphuric acid $50 \text{ C.C} \text{ required for complete precipitation}$

$4 \text{ C.C} \text{ of solution} A + 4 \text{ C.C} \text{ of solution} \ B$ which $= 0.44 \text{ gram}$ of $SO_3 B \times 0.44 \times 2 = 0.88 \text{ gram}$ in $100 \text{ C.C} \text{ of urine}$

therefore as $100 \times 0.88 \times 2075 = 1.82 \text{ gram}$

total as expected.

He now took from Jan. 27th to Feb. 9th $2 \text{ sulphuric acid} \text{ of potassium} \text{ daily regularly every day; during which time I made}$

eight analyses of his urine.

In the first, he passed, after having

had two sulphuric acids of potassium tablets,

$2260 \text{ C.C} \text{ of urine} \ Sp. gr. 1015$. Amount of sulphuric acid $50 \text{ C.C} \text{ required for com}
Complete precipitation. 4 C.C. of solution A + 2 C.C. of solution B. Which = .042 gran. of S03. 042 x 2 = .084 gran. in 100 C.C. Therefore as 100: .084 = 2260: 1.89 c.m.

During the next 24 hours he passed 2230 C.C. of urine. Op. q. 1013. Amount of sulphuric acid. 50 C.C. required for complete precipitation. 3 C.C. of solution A + 5 C.C. of solution B. Which = .035 gran. of S03. .035 x 2 = .070 gran. in 100 C.C. of urine.

Therefore as 100: .070 = 2230: 1.56 gram.

On the next 24 hours he passed 1730 C.C. of urine. Op. q. 1012. Amount of sulphuric acid. 50 C.C. required for complete precipitation. 4 C.C. of solution A + 6 C.C. of solution B. Which = .046 gran. of S03. .046 x 2 = .092 gran. in 100 C.C. of urine.

Therefore as 100: .092 = 1730: 1.81 gram.

In the next 24 hours he passed
1380 C.C. of urine. Amount of Sulphuric Acid 50 C.C. required for complete precipitation 3 C.C. of Solution A + 8 C.C. of Solution B. Which = 0.38 gram of 50 C.C.

0.38 x 2 = 0.76 gram. in 100 C.C. of urine therefore as 100 x 0.76 = 1380 x 1.04 gram.

In the next 24 hours he passed

1995 C.C. of urine. Amount of Sulphuric Acid 50 C.C. required for complete precipitation 3 C.C. of Solution A + 7 C.C. of Solution B. Which = 0.37 gram of 50 C.C.

0.37 x 2 = 0.74 gram. in 100 C.C. of urine therefore as 100 x 0.74 = 1995 x 1.04 gram.

In the next 24, he passed

1930 C.C. of urine. Sp. gr. 1.011. Amount of Sulphuric Acid 50 C.C. required for complete precipitation 3 C.C. of Solution A + 9 C.C. of Solution B. Which = 0.39 gram. of 50 C.C.

0.39 x 2 = 0.78 gram. in 100 C.C. of urine therefore as 100 x 0.78 = 1930 x 1.03 gram.
In the 24th hour, total quantity passed amount to 1300 c.c.  

Sp. gr. 1.071 - Amount of Sulphuric Acid - 50 c.c. required for complete precipitation 4 c.c. of solution A + 12 c.c. of Solution B, which = .041 gram of S03  

0.041 x 2 = .082 gram in 100 c.c. of urine.  

Therefore 2100: .082 = 1300: 1.08 gram.  

In the 24th hour, he passed 1550 c.c. of urine.  

Sp. gr. 1.071 - Amount of Sulphuric Acid - 50 c.c. required for complete precipitation 3 c.c. of solution A + 8 c.c. of Solution B, which = .038 gram of S03  

0.038 gram x 2 = .076 gram in 100 c.c. of urine.  

Therefore 2100: .076 = 1550: 1.17.  

From comparing these results, it is obvious that as the secretion of potassium salts had no effect on the amount of Sulphuric Acid given off by the kidneys daily,  

For if we contrast the first day.
Analysis made after he had come.

After omitting the baths with three great

precious to 67, we get the following result:

Analysis previous to taking the sulphur baths.

1.26
1.81
1.09
1.86 Mean being 1.51.
1.27
1.82

total 9.11 grams.

This analysis made while taking sulphur baths.

1.89
1.56
1.81
1.81
1.04 Mean being 1.54.

1.47
1.50

Total 9.27 grams.
From these results it would appear that sulphan tincture, internally, is less toxic than by local or rectal absorption, liberated into the blood, from which it is again eliminated by the kidneys in the form of sulphanic acid, in combination with various bases. That even a small proportion of sulphan to be taken is sufficient to cause a manifest increase of sulphanic acid in the urine, as further that it affects that secretion shortly after its introduction into the system.

In the case of sulphan applications applied to the skin, it seems that the ill preserves the amount of sulphanic acid given off by the kidneys, at a more uniform rate (that is the amount from day to day acid last year, as it had done previous to its application) and while it also appears to increase the total amount excreted over a given time, still it does
It cause such a Cough and Heated like in the Sulphuric Acid gave off, as when Sulphur was used internally. Thus as has been before seen, the average excursions from day to day did not exceed and even in some cases did not come up to the higher daily excursions which sometimes took place, previous to his being subjected to treatment; but at the same time there fell to the all the mean average, I would say then, that it is absolutely in small quantity, that it also appears to affect the amount, etc., after the or two applications, and further that it has no lasting effect on the quantity given off.

As to Aqueous baths, as before stated, these in this form she has not seen to be absorbed at all, to as much as the quantity of Sulphuric Acid ever increased above, and varied as much as it has done previous to the patient being subjected to this treatment...
Consequently what good effects may be derived from it are entirely local due to a local action, it may have either on the skin itself, or on the nerves and bloodvessels of that tissue.

Finis